

CLAIMS:

1. A calcined dehydrogenation catalyst comprising a calcination product of
 - a) at least one iron oxide or a carbonate, bicarbonate, nitrate, hydroxide, oxalate or other similar conjugate base of a weak acid ;
 - 5 b) a carbonate, bicarbonate, nitrate, hydroxide, oxide or oxalate of an alkali metal or other similar conjugate base of a weak acid;
 - c) a carbonate, bicarbonate, nitrate, hydroxide, oxide or oxalate or other similar conjugate of a weak acid of at least one member of the group consisting of indium, calcium, samarium, cerium, sodium, molybdenum, tungsten, zinc, manganese, copper and lanthanum; and
 - 10 d) an alumina or silica-alumina support material having a bulk density from 0.9 to 1.3 grams per cubic centimeter, and an average particle size of from 30 to 300 microns.
2. The calcined dehydrogenation catalyst of Claim 1 wherein (c) is indium.
- 15 3. The calcined dehydrogenation catalyst of Claim 1 wherein (c) is cerium
4. The calcined dehydrogenation catalyst of Claim 1 wherein (c) is sodium.
5. The calcined dehydrogenation catalyst of Claim 1 wherein (c) is calcium.
6. The calcined dehydrogenation catalyst of Claim 1 wherein (c) is samarium.
7. The calcined dehydrogenation catalyst of Claim 1 wherein (c) is tungsten.
- 20 8. The calcined dehydrogenation catalyst of Claim 1 wherein (c) is molybdenum.
9. The calcined dehydrogenation catalyst of Claim 1 wherein (c) is present in an amount of from 0.01 to 4 percent by weight based on the weight of the total catalyst composition.
10. The calcined dehydrogenation catalyst of Claim 1 wherein in (b) the alkali metal
 - 25 is potassium in the form of the oxide and wherein (c) is indium oxide.
 11. The calcined dehydrogenation catalyst of Claim 9 wherein (c) is cerium oxide.
 12. The calcined dehydrogenation catalyst of Claim 9 wherein (c) is calcium oxide.
 13. The calcined dehydrogenation catalyst of Claim 9 wherein (c) is samarium oxide.
 - 30 14. The calcined dehydrogenation catalyst of Claim 9 wherein (c) is sodium oxide.
 15. The calcined dehydrogenation catalyst of Claim 9 wherein (c) is molybdenum oxide.

16. The calcined dehydrogenation catalyst of Claim 1 wherein the bulk density is from 0.95 to 1.1 grams per cubic centimeter.

17. A process for preparing a calcined dehydrogenation catalyst comprising:

a) adding an active phase in the form of an aqueous solution of

(i) at least one iron oxide or a carbonate, bicarbonate, nitrate, hydroxide, oxalate or other similar conjugate base of a weak acid ;

(ii) a carbonate, bicarbonate, nitrate, hydroxide, oxide or oxalate or other similar conjugate base of a weak acid of an alkali metal; and

(iii) a carbonate, bicarbonate, nitrate, hydroxide, oxide or oxalate or other similar conjugate base of a weak acid of at least one member of the group consisting of indium, calcium, samarium, cerium, sodium, molybdenum, tungsten, zinc, manganese, copper and lanthanum to an alumina or silica-alumina support material having a bulk density from 0.9 to 1.3 grams per cubic centimeter and an average particle size of

from 30 to 300 microns;

b) drying the support material containing the active phase to remove the water; and

c) calcining the dried support material containing the active phase to a finished catalyst.

18. The process of Claim 17 wherein (a)(iii) is indium.

19. The process of Claim 17 wherein (a)(iii) is cerium.

20. The process of Claim 17 wherein (a)(iii) is sodium.

21. The process of Claim 17 wherein (a)(iii) is molybdenum.

22. The process of Claim 17 wherein (a)(iii) is tungsten.

23. The process of Claim 17 wherein (a)(iii) is calcium.

24. The process of Claim 17 wherein (a)(iii) is samarium.

25. The process of Claim 17 wherein (a)(iii) is an oxide which is present at from 0.01 to 4 weight percent based on the total weight of the finished catalyst composition.

26. The process of Claim 17 wherein in (b) the drying occurs at 80 to 200°C for 1 to 12 hours and in (c) the calcining occurs at 500 to 950°C for 3 to 8 hours.

27. The process of Claim 17 wherein the bulk density of the finished catalyst is from 0.95 to 1.1 grams per cubic centimeter.

28. A process of dehydrogenating an alkyl aromatic hydrocarbon compound which comprises contacting said compound with the calcined dehydrogenation catalyst of Claim 1 in the presence of a diluent at a sufficient temperature to dehydrogenate the alkyl aromatic hydrocarbon compound and produce a vinyl aromatic hydrocarbon compound.

5 29. The process of Claim 28 in which the alky aromatic hydrocarbon compound is selected from ethylbenzene, isopropylbenzene and alpha-methyl ethlybenzene to produce styrene, cumene and alpha-methyl styrene, respectively.

30. The process of Claim 28 in which said catalyst is separated from the contacting step for regeneration in an oxygen-containing gas, optionally in the presence of a diluent, so
10 that any residual hydrocarbon is removed and the calcined dehydrogenation catalyst is restored to its original condition and recycled to said contacting step.

31. The process of Claim 28 in which said diluent is a paraffinic hydrocarbon compound and an alkenyl hydrocarbon compound is also produced.